

AMENDMENTS TO THE CLAIMS

Claim 1 (currently amended) A method for providing a sensor network comprising:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user, wherein the plurality of node types includes at least one node of a first type and at least one node of a second type, and wherein the at least one node of a first type includes at least one sensor that receives data from the at least one environment;

remotely controlling at least one function of the plurality of node types;

collecting data from the at least one environment using the at least one sensor;

providing node resource information from the at least one node of a second type to the plurality of network elements; and

distributing storage and processing of the collected data among the plurality of network elements in response to the node information, wherein distributing storage and processing of the collected data comprises transferring data from the at least one node of a first type to two or more local nodes ~~at least one local node~~ of the plurality of network elements and processing of the transferred data by the two or more local nodes ~~at least one local node~~.

Claim 2 (original) The method of claim 1, further comprising performing a first type of data manipulation by the at least one node of a first type and performing a second type of data manipulation by the at least one node of a second type.

Claim 3 (original) The method of claim 1, further comprising automatically organizing the plurality of network elements in response to the node information, wherein the automatic organizing comprises automatically controlling data transfer, processing, and storage among the plurality of network elements.

Claim 4 (original) The method of claim 1, further comprising supporting a plurality of levels of synchronization among different subsets of the plurality of network elements, wherein a first level of synchronization is supported among a first subset of the plurality of network elements,

wherein a second level of synchronization is supported among a second subset of the plurality of network elements.

Claim 5 (original) The method of claim 1, further comprising controlling data processing using at least one processing hierarchy, the at least one processing hierarchy controlling at least one event selected from a group consisting of data classifications, data transfers, data queuing, data combining, processing locations, and communications among the plurality of network elements.

Claim 6 (original) The method of claim 1, further comprising self-assembling the plurality of network elements, wherein search and acquisition modes of the at least one node of a second type search for participating ones of the plurality of network elements, wherein a determination is made whether each of the participating ones of the plurality of network elements are permitted to join the sensor network using a message hierarchy, wherein the sensor network is surveyed at intervals for new nodes and missing nodes.

Claim 7 (original) The method of claim 1, further comprising managing the plurality of network elements as a distributed and active database using a distributed resource management protocol, wherein the plurality of network elements are reused among different applications, wherein the network elements are used in multiple classes of applications.

Claim 8 (original) The method of claim 1, wherein the at least one function includes data acquisition, data processing, communication, data routing, data security, programming, and node operation.

Claim 9 (original) The method of claim 1, wherein the at least one node of a first type includes at least one preprocessor coupled among at least one state machine, at least one application programming interface (API), and at least one sensor.

Claim 10 (original) The method of claim 1, wherein the at least one node of a second type includes at least one preprocessor coupled to at least one processor and a plurality of application programming interfaces (APIs), wherein the plurality of APIs are coupled to control at least one device selected from a group consisting of sensors, actuators, communications devices, signal

processors, information storage devices, node controllers, and power supply devices. wherein the plurality of APIs are support remote reprogramming and control of the at least one device.

Claim 11 (original) The method of claim 10, further comprising layering the plurality of APIs.

Claim 12 (original) The method of claim 10, further comprising:

enabling distributed resource management with the plurality of APIs by providing network resource information and message priority information to the plurality of network elements; and

controlling information transfer among the plurality of network elements using a synchronism hierarchy established in response to the resource information and message priority information.

Claim 13 (original) The method of claim 10, wherein the at least one preprocessor performs at least one function selected from a group consisting of data acquisition, alert functions, and controlling at least one operating state of the at least one node, wherein the at least one processor performs at least one function selected from a group consisting of signal identification, database management, adaptation, reconfiguration, and security.

Claim 14 (original) The method of claim 1, further comprising controlling data processing, transmission, and storage among the plurality of network elements in response to a decision probability of a detected event.

Claim 15 (original) The method of claim 1, further comprising performing at least one operation on the collected data in response to parameters established by a user, the at least one operation selected from a group consisting of energy detection, routing, processing, storing, and fusing.

Claim 16 (original) The method of claim 15, wherein the routing, processing, storing, and fusing are performed in response to at least one result of the energy detection.

Claim 17 (original) The method of claim 15, wherein routing comprises selecting at least one

data type for routing, selecting at least one of the plurality of network elements to which to route the selected data, selecting at least one route to the selected at least one of the plurality of network elements, and routing the selected at least one data type to the selected at least one of the plurality of network elements.

Claim 18 (original) The method of claim 15, wherein processing comprises selecting at least one data type for processing, selecting at least one processing type, selecting at least one of the plurality of network elements to perform the selected at least one processing type, and transferring the selected at least one data type to the selected at least one of the plurality of network elements using at least one route through the sensor network.

Claim 19 (original) The method of claim 18, wherein the selection of at least one processing type comprises determining at least one probability associated with a detected event and selecting at least one processing type in response to the at least one probability.

Claim 20 (original) The method of claim 18, further comprising aggregating data processed in a plurality of nodes for further processing by other nodes.

Claim 21 (original) The method of claim 18, further comprising aggregating data processed by the at least one node for reporting to the at least one user.

Claim 22 (original) The method of claim 15, wherein storing comprises selecting at least one data type for storage, selecting at least one storage type, selecting at least one of the plurality of network elements to perform the selected at least one storage type, and transferring the selected at least one data type to the selected at least one of the plurality of network elements using at least one route through the sensor network.

Claim 23 (original) The method of claim 15, wherein fusing comprises a first node transmitting at least one query request to at least one other node, wherein the first node collects data from the at least one other node in response to the at least one query request and processes the collected data.

Claim 24 (original) The method of claim 1, further comprising supporting at least one

communication mode among the plurality of network elements, wherein the at least one communication mode is selected from a group consisting of wireless communications, wired communications, and hybrid wired and wireless communications.

Claim 25 (previously presented) The method of claim 1, further comprising coupling the at least one node of a first type and the at least one node of a second type to the at least one user using at least one of the plurality of network elements, wherein the plurality of network elements includes at least one gateway, at least one server, and at least one network, wherein the at least one network includes wired networks, wireless networks, and hybrid wired and wireless networks.

Claim 26 (original) The method of claim 25, wherein the at least one network comprises at least one network selected from a group comprising the Internet, local area networks, wide area networks, metropolitan area networks, and information service stations.

Claim 27 (original) The method of claim 26, further comprising internetworking among the plurality of network elements to provide remote accessibility using World Wide Web-based tools to data, code, management, and security functions, wherein data includes signals, wherein code includes signal processing, decision support, and database elements, and wherein management includes operation of the at least one node and the sensor network.

Claim 28 (original) The method of claim 25, wherein the at least one gateway performs at least one function selected from a group consisting of protocol translation, management of the plurality of network elements, management of communications with at least one remote user, management of communications with at least one local user, and interfacing with at least one communication physical layer including wired local area networks, packet radio, microwave, optical, wireline telephony, cellular telephony, and satellite telephony.

Claim 29 (original) The method of claim 1, wherein the plurality of network elements further comprise at least one database, wherein the at least one database includes at least one storage device selected from a group consisting of storage devices coupled to at least one of the plurality of network elements and storage devices separate from the plurality of network elements.

Claim 30 (original) The method of claim 29, further comprising providing non-local event correlation using cooperative sensing with information of the at least one database.

Claim 31 (original) The method of claim 29, wherein the at least one database comprises data-driven alerting methods that recognize conditions on user-defined data relationships including coincidence in signal arrival, node power status, and network communication status.

Claim 32 (original) The method of claim 29, further comprising implementing the at least one database in small foot print databases at a level of the at least one node of a second type and in standard query language (SQL) database systems at a level of at least one server.

Claim 33 (original) The method of claim 1, wherein the at least one node of a second type includes sensing, processing, communications, and storage devices supporting a plurality of processing and protocol layers.

Claim 34 (original) The method of claim 1, further comprising establishing at least one redundant information pathway among the plurality of network elements.

Claim 35 (original) The method of claim 1, wherein the plurality of network elements comprise a plurality of network element sets, wherein the plurality of network element sets are layered.

Claim 36 (original) The method of claim 1, wherein the at least one node comprises a plurality of node types, wherein the plurality of node types includes at least one node of a first type and at least one node of a second type, wherein a first network having a first node density is assembled using the at least one node of a first type, wherein a second network having a second node density is assembled using the at least one node of a second type, wherein the second network is overlayed onto the first network.

Claim 37 (original) The method of claim 1, further comprising predistributing code and data anticipated for future use through the sensor network using low priority messages, wherein the code and the data are downloadable from at least one location selected from a group consisting of storage devices of the plurality of network elements, and storage devices outside the sensor network.

Claim 38 (original) The method of claim 1, further comprising transferring data using message packets, wherein the message packets are aggregated into compact forms in the at least one node using message aggregation protocols, wherein the message aggregation protocols are adaptive to at least one feature selected from a group consisting of data type, node density, message priority, and available energy, wherein the message packets include decoy message packets, wherein information to be transferred is impressed on random message packets to provide communication privacy.

Claim 39 (original) The method of claim 1, wherein the at least one node of a first type and the at least one node of a second type include at least one sensor selected from a group consisting of seismic, acoustic, infrared, thermal, force, vibration, pressure, humidity, current, voltage, magnetic, biological, chemical, acceleration, and visible light sensors.

Claim 40 (original) The method of claim 1, wherein at least one of the plurality of network elements determines a position of at least one other of the plurality of network elements.

Claim 41 (original) The method of claim 1, further comprising transferring software among the plurality of network elements, wherein the software transfer is remotely controllable.

Claim 42 (original) The method of claim 1, further comprising protecting communications among the plurality of network elements using at least one public key security protocol.

Claim 43 (original) The method of claim 1, further comprising determining at least one location of at least one of the plurality of network elements using location and time information of at least one Global Positioning System (GPS) device.

Claim 44 (original) The method of claim 1, wherein the plurality of node types comprise at least one node type selected from a group consisting of sensor nodes, gateway nodes, thin film substrate sensor nodes, tag nodes, conformal nodes, wired nodes, wireless nodes, personnel nodes, equipment nodes, and vehicle internetwork nodes.

Claim 45 (original) The method of claim 1, further comprising supporting short range and long range communications among the plurality of network elements.

Claim 46 (previously presented) A method of operating a sensor network, comprising:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user computer;

collecting data from the at least one environment using at least one node of a first type;
and

distributing processing of the collected data from the at least one node of a first type to two or more local nodes of the plurality of network elements.

Claim 47 (previously presented) The method of claim 46, further comprising:

remotely programming and controlling at least one function of the plurality of node types in response to the collected data via internetworking among the plurality of network elements;

providing node information including node resource information and message priority from at least one node of a second type to the plurality of network elements; and

wherein the distributing processing of the collected data is in response to the node information.

Claim 48 (currently amended) A computer readable medium containing executable instructions which, when executed in a processing system, cause the processing system to collect and process data in a sensor network by:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user, wherein the plurality of node types includes at least one node of a first type and at least one node of a second type, and wherein the at least one node of a first type includes at least one sensor that receives data from the at least one environment;

remotely controlling at least one function of the plurality of node types;

collecting data from the at least one environment using the at least one sensor;

providing node resource information from the at least one node of a second type to the plurality of network elements; and

distributing storage and processing of the collected data among the plurality of network elements in response to the node information, wherein distributing storage and processing of the collected data comprises transferring data from the at least one node of a first type to two or more local nodes ~~at least one local node~~ of the plurality of network elements and processing of the transferred data by the two or more local nodes ~~at least one local node~~.

Claim 49 (currently amended) An electromagnetic medium containing executable instructions which, when executed in a processing system, cause the processing system to collect and process data in a sensor network by:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user, wherein the plurality of node types includes at least one node of a first type and at least one node of a second type, and wherein the at least one node of a first type includes at least one sensor that receives data from the at least one environment;

remotely controlling at least one function of the plurality of node types;

collecting data from the at least one environment using the at least one sensor;

providing node resource information from the at least one node of a second type to the plurality of network elements; and

distributing storage and processing of the collected data among the plurality of network elements in response to the node information, wherein distributing storage and processing of the collected data comprises transferring data from the at least one node of a first type to two or more local nodes ~~at least one local node~~ of the plurality of network elements and processing of the transferred data by the two or more local nodes ~~at least one local node~~.

Claim 50 (currently amended) A computer readable medium containing executable instructions which, when executed in a processing system, cause the processing system to collect and process data in a sensor network by:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user computer;

collecting data from the at least one environment using at least one node of a first type;
and

distributing processing of the collected data from the at least one node of a first type to
two or more local nodes of the plurality of network elements.

Claim 51 (currently amended) A computer readable ~~An electromagnetic~~ medium containing executable instructions which, when executed in a processing system, cause the processing system to collect and process data in a sensor network by:

coupling a plurality of network elements including a plurality of node types among at least one environment and at least one user computer with at least one Internet coupling;

collecting data from the at least one environment using at least one node of a first type;

distributing processing of the collected data from the at least one node of a first type to
two or more local nodes of the plurality of network elements;

providing node information including node resource information and message priority from at least one node of a second type;

remotely programming and controlling at least one function of the plurality of node types in response to the collected data and node information via internetworking among the plurality of network elements.

Claim 52 (currently amended) The method of claim 1, wherein the data transferred to the two or more local nodes ~~at least one local node~~ comprises: at least a portion of the collected data; and/or processed data derived from the collected data.

Claim 53 (previously presented) The method of claim 1, wherein processing of the transferred data comprises one or more of the following: data combining, data transfer, or fusing.

Claim 54 (currently amended) A method for providing a sensor network comprising:

coupling a plurality of nodes among an environment, wherein at least one node of the plurality of nodes includes at least one sensor that receives data from the environment;

collecting data from the environment using the at least one sensor; and

distributing storage and processing of the collected data among the plurality of nodes, wherein distributing storage and processing of the collected data comprises transferring data from the at least one node to two or more ~~one~~ local nodes of the plurality of nodes and processing of the transferred data by the two or more ~~one~~ local nodes.

Claim 55 (previously presented) The method of claim 54, wherein distributing storage and processing of the collected data further comprises: selecting at least one data type for processing, selecting at least one processing type, selecting at least one of the plurality of nodes to perform the selected at least one processing type, and transferring the selected at least one data type to the selected at least one of the plurality of nodes.

Claim 56 (currently amended) A method for providing a sensor network comprising:

coupling a plurality of network elements among an environment, wherein the plurality of network elements includes at least one node comprising a sensor that receives data from the environment;

remotely controlling at least one function of the plurality of node types;

collecting data from the at least one environment using the at least one sensor; and

distributing processing of the collected data among the plurality of network elements in response to at least one parameter of a signal received from the at least one environment, wherein distributing processing of the collected data comprises transferring data from the at least one node to two or more local nodes ~~at least one local node~~ of the plurality of network elements.